THURSDAY, FEBRUARY 4, 1875

BOTANICAL PROBLEMS*

SUCH is the title of an article by Prof. Cohn on the history of botany in the new German periodical, the *Deutsche Rundschau*.

Circumstances seem to have determined the direction of the researches of English botanists of the present period, who, almost without exception, have devoted their whole time to descriptive botany. On the other hand, continental botanists have pursued vegetable physiology and anatomy with great assiduity. This separation of what should be inseparable branches of the same science is in all probability only temporary. The great demand for descriptive works on the vegetation of our various colonies, and the immense mass of undescribed plants in our herbaria, have, doubtless, influenced in no small degree the direction of the labours of our botanists. In return, poverty in herbarium specimens and books renders it impossible for many continental botanists to pursue successfully systematic botany. Apart from its importance from an economic point of view, descriptive botany is of relatively little absolute value, and must be extremely unsatisfactory to minds labouring to prove the immutability of species on the one hand, or their variability within certain defined limits on the other. Whether we follow Jordan, with his 200 species of Draba (*Erophila*), the result of the dismemberment of *D. verna*; or Regel, who combines *Vitis vinifera*, *Labrusca*, *vulpina*, &c., we should equally drift into an utterly impracticable and useless system, and one of no utility whatsoever in the solution of problems which we may reasonably hope to unravel.

This brings us to a consideration of Cohn's article, professedly written to show the importance and popularise the study of botany, more particularly in its biological bearings. Naturally we may look for some tolerably sharp criticisms of systematic botany studied alone, and the writer is to some extent justified in more especially singling out England. Nevertheless, we think that its importance is underrated by some continental botanists. Prof. Cohn is a great admirer of the Aristotelian school, and to the great master and his pupil, Theophrastus, he gives the credit of having initiated the scientific study of plants, which after their time declined and lay dormant for upwards of 2,000 years. The discoveries of the last two centuries he consequently looks upon as a revival of this science, and as so many solutions of problems propounded, though, as he admits, not answered, by Theophrastus. We certainly should assign a more modest share of credit to these early philosophers, and Cohn's quotation from Goethe, "when we consider the problems of Aristotle we are astonished at the great powers of observation and universal perception of the Greeks; but they are too hasty, passing at one step from the phenomena to their interpretation, hence their conclusions are often inadequate and theoretical," does not strengthen his position. After all, this is a question of little moment. It is quite true that nothing approaching a philosophical study of plants was resumed before the seventeenth century.

Prof. Cohn gives a sketch of the history of botany, hastily disposing of the "root-grubbers and collectors of simples," from Dioscorides and Galen down to the herbalists of the seventeenth century. To Erasmus he traces the impulse given to this and other branches of learning in the Netherlands and North-western Germany. The fact that the dwellers on the Rhine did not find the same plants described by Dioscorides, may be said to have offered the first lesson in phytogeography, which was rapidly developed by the spirit of travel and discovery which soon set in.

Naturally one of the first things to impress itself on the minds of those engaged in the study of plants as their numbers increased, was the necessity for some system of classification and nomenclature. The history of binominal nomenclature and the sexual system of Linnæus, and the natural system of A. L. de Jussieu, are too well known to need repetition, and Cohn does not attempt to trace the gradual growth of knowledge which led up to the development of these ideas. In fact, he appears to attach so little importance to systematic botany, that he goes on to say: "Under the dominating influence of Linnæus, botany seems to have stagnated more and more, whilst a new spirit had been infused into the study of other sciences." He then refers to the philosophical teachings of Bacon, which fell upon a well-prepared soil and eventually bore fruit. Botanists began to make experiments and study the laws of nature. Hales was the first to investigate some of the phenomena of plant life in their physical aspects. Du Hamel, Bonnet, Ingenhousz, Priestley, Saussure, and others followed, and raised the study of vegetable physiology and chemistry to a level with the exact sciences. The solution of other botanical problems is given in outline, and where only a few names could be given it is not to be wondered at that Germans figure more prominently than would be the case in a detailed history. The merit of solving a particular botanical problem can in few instances be claimed for one man alone. Discovery is progressive, and a complete insight into many of the processes of plant-life have been gradually unfolded. Goethe's solution of the morphological problem is naturally dwelt upon at some length, and no one will gainsay its importance in systematic botany. Grew and Malpighi initiated vegetable anatomy, and it is a noteworthy fact, says Cohn, that the papers of these two fathers were handed over to the Royal Society of London on the same day, Dec. 29, 1671. But a hundred years elapsed before their labours were appreciated and continued.

In the revival of this branch of botany Prof. Cohn has a strong array of German names, many of them of world-wide fame. The conceptions of Darwin and their importance are barely mentioned, though in no country have they exerted a more fundamental influence than in Germany. Passing into the region of unsolved problems, Cohn cites the unconquerable vitality of the potato fungus, and the uncertainty existing respecting the presence and signification of minute fungi in cholera and other diseases.

In conclusion, Prof. Cohn rejoices in the fact that botany has freed itself from the fetters which formerly

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* "Botanische Probleme," von Prof. Cohn (*Deutsche Rundschau*, Heft 1).

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limited its field of operation and discovery. "It has already furnished us with a clue to many of the mysteries of life, and we look to it for many more: what is life? what is death?" This last quotation will show that he puts no limit to the phenomena to be considered in the investigations of the biologist; but when man has solved all these problems, he will be as wise, if not as powerful as the gods.

SOUTH AMERICAN TRAVEL *

II.

Travels in South America, from the Pacific Ocean to the Atlantic Ocean. By Paul Marcoy. Illustrated by 525 engravings and ten maps. Two vols. (London: Blackie and Son, 1875.)

The Amazon and Madeira Rivers: Sketches and Descriptions from the Note-book of an Explorer. By Franz Keller, Engineer. With sixty-eight illustrations on wood. (London: Chapman and Hall, 1874.)

Two Years in Peru, with Exploration of its Antiquities. By T. J. Hutchinson, M.A.I. With map and numerous illustrations. Two vols. (London: Sampson Low, 1873.)

MR. KELLER'S work is a much more business-like and compact production than that of M. Marcoy, noticed in last week's number. While the beautiful illustrations which enrich the book show that the author has a high power of artistic reproduction, and while this may have led him to throw over the scenes he endeavours to reproduce a little touch of glamour, a little of "the light that never was on sea or land," one feels on reading Mr. Keller's narrative that he is in the hands of a thoroughly earnest and trustworthy observer. He has, however, committed the sin of publishing a narrative of exploration without a map. We should mention also that not one of the three books we are noticing contains an index, a want which will considerably impair their usefulness to the student.

Mr. Keller's work is almost entirely concerned with the Madeira, the largest tributary of the Amazon from the south. His journey from the time of his departure from, till his return to Para was accomplished between November 1867 and December 1868, a period of thirteen months, during which, including vexatious delays, he ascended the Madeira as far as Trinidad, on the Mamore, in Bolivia. If our readers look at a map, they will see that Mr. Keller could not have been idle during the time, especially when it is remembered that his purpose was to make a careful hydrographical inspection of the Madeira, in order to report upon the possibility of utilising it as a navigable highway for commerce.

The river, as far as Santo Antonio, seems capable of being rendered quite navigable, but above this the rapids are so numerous and formidable that it seems hopeless to expect that the upper river can ever be made available for anything but boats. The only means, therefore, by which the treasures that exist in the interior of South America can be made accessible by the Madeira route is by a railway from Santo Antonio upwards. It would seem that some such project is in contemplation. The construction of railways, we learn from Mr. Hutchinson's work, is being carried out rapidly in Peru on a very extensive scale, mainly under the superintendence of Mr. Henry Meiggs, who has difficulties of the most formidable kind to contend with in piercing the Andes; in a short time, however, we may expect to see all parts of this country easy of access. In Brazil the mere engineering part of the work would seem to present no difficulties whatever.

Before any such scheme is carried out, ere the whole of this primeval region be devirginated by swarms of white men, we hope that its natural history and ethnology will be fully if not exhaustively investigated. In this respect such works as those of Marcoy and Keller are of great value.

Mr. Keller made excellent use of the short time he spent in the interior; for while he most faithfully and successfully accomplished the mission with which he was entrusted, he at the same time made a series of really valuable observations on all that he saw that was worth noting. His narrative is not, however, arranged in the same method as that of M. Marcoy, who recounts each day's experience as he proceeds, and in whose case, therefore, the want of an index is peculiarly felt. Mr. Keller has systematised the results of his journey, and in a series of chapters gives a clear and well-written summary of his observations. In an introductory chapter he gives a brief account of what is known of the physical and social condition of Brazil and of its political history. He then, in two chapters, gives a sort of itinerary of his expedition up the Madeira, with occasional observations on the inhabitants and the natural history of its banks, and a very clear and full account of the difficulties attending his attempt to navigate the river, so studded with rapids, past every one of which his fleet of boats had to be carried. The region seems to be very sparsely peopled, though its natural resources are superabundant. The material of the hills over the whole region of the rapids he found to be the same; "gneiss, with mostly a very pronounced stratification, and always the same run. He examined it very closely," he states, "expecting to find, according to theory of Agassiz, numerous erratic boulders of different composition lying on the regularly formed rock. But neither there nor higher up in Bolivia could we discover any trace of these 'foundlings,' even as Agassiz himself was unable to discover, in the environs of Rio de Janeiro, the *roches striées* and *roches moutonnées* of Switzerland, which testify to an ice-period with its immense glaciers."

In the chapter headed "Canoe and Camp Life," Mr. Keller gives a graphic account of the daily life of an expedition such as his; and in another, on "Hunting and Fishing," he gives a pretty full idea of the larger fauna to be met with on the route he traversed. In the succeeding one he describes the vegetation of the virgin forest of the Madeira and Amazon, devotes considerable space to the Caoutchouc Tree which so abounds here, and to an account of the process by which its sap is converted into the indiarubber of commerce. He also gives a list of the other principal plants which are utilised for commercial purposes, in the shape of medicines, oils, resins, dye-stuffs, ropes, &c.; and it strikes one that it would certainly be worth while to make a region so superabundantly stored with animal and vegetable life of such great practical utility to man, easily accessible to the merchants of the world.

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* Continued from p. 245.

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